



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF : ALLEN  
SERIAL No. : 10/067,037  
FOR : A CASING SCRAPER  
FILED : February 4, 2002  
ATTORNEY DOCKET NO. : WPT 2 0029

Cleveland, Ohio 44114-2518  
April 3, 2002

PATENT

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**TRANSMITTAL LETTER OF 35 U.S.C. § 119 FOREIGN PRIORITY CLAIM  
FOREIGN PRIORITY DOCUMENTS**

Assistant Commissioner for Patents  
Washington, D.C. 20231

Dear Sir:

Applicant hereby claims priority under 35 U.S.C. § 119 for the above-identified U.S. patent application. This claim of priority is based upon **British Application No. GB-0102931.3, filed February 6, 2001 and British Application No. GB-0107011.9, filed March 21, 2001.** A certified copy of each prior British application is enclosed.

Respectfully submitted,

**FAY, SHARPE, FAGAN,  
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I hereby certify that this TRANSMITTAL LETTER and ASSIGNMENT are being deposited with the United States Postal Service by first class mail in an envelope addressed to the Commissioner of Patents and Trademarks, Washington, D.C. 20231 on April 3, 2002.

  
Georgeann B. George





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The Patent Office  
Concept House  
Cardiff Road  
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NP10 8QQ

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

I also certify that by virtue of an assignment registered under the Patents Act 1977, the application is now proceeding in the name as substituted.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

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Signed

Dated

1 February 2002





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By virtue of a direction given under Section 30 of the Patents Act 1977, the application is proceeding in the name of

RUFF PUP LIMITED  
Incorporated in the United Kingdom  
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[ADP No. 08222150001]



## Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road

Newport

Gwent NP9 1RH

1. Your reference

AW/P200586GB

2. Patent application number

(The Patent Office will fill in this part)

0102931.3

07FEB01 E603797-1 D00335

P01/7700 0.00-0102931.3

3. Full name, address and postcode of each applicant (underline all surnames)

SECTION 30(1)(a) ACT  
Anthony ALLEN, Five Mile Caravan Site,  
Kingswells, ABERDEEN, Scotland,  
AB15 8PW

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

APPLICATION FILED 15-08-2001  
7730088001

4. Title of the invention

A CASING SCRAPER

5. Name of your agent (if you have one)

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

W. P. Thompson & Co.  
Kings Building  
South Church Side  
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East Yorkshire  
HU1 1RR

Patents ADP number (if you know it)

0000158004

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

Priority application number  
(if you know it)

Date of filing  
(day / month / year)

-

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing  
(day / month / year)

-

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

No

a) any applicant named in part 3 is not an inventor, or

b) there is an inventor who is not named as an applicant, or

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9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

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Description 9

Claim(s) -

Abstract -

Drawing(s) 3 + 3

please see  
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10. If you are also filing any of the following, state how many against each item.

Priority documents -

Translations of priority documents -

Statement of inventorship and right to grant of a patent (Patents Form 7/77) -

Request for preliminary examination and search (Patents Form 9/77) -

Request for substantive examination (Patents Form 10/77) -

Any other documents (please specify) -

11. I/We request the grant of a patent on the basis of this application.

Signature

*W. P. Thompson*

Date 5 February 2001

W. P. THOMPSON & CO.

12. Name and daytime telephone number of person to contact in the United Kingdom

Mr. A. J. A. Walker  
Tel: 01482 223451

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DESCRIPTION"A CASING SCRAPER"

5 The present invention relates to a casing scraper for cleaning the interior of a tubular member and more specifically for cleaning the inside of pipelines or oil, gas, or water well casings, tubes or pipes.

10 It is usual to ensure and maintain the physical integrity of a well bore hole by lining it with a casing, typically steel pipe, as it is drilled. This casing wall is cemented in place during completion of the drilling operation. This cementing operation leaves cement residue on the casing wall which must be removed before the well is put into production. Furthermore cleaning of the casing wall is necessary at intervals during well production to remove accumulated debris and residues, such as oil, paraffin and scale. Studies have demonstrated that debris and residues on the internal walls of the well casing have a negative impact on well productivity.

15 The standard tools used for cleaning casing walls are referred to as casing scrapers and are well known in the art. Typically a casing scraper comprises a cylindrical body having a plurality of scraper blades or wire bristles disposed at intervals around its outer surface, and a mandrel which facilitates connection to a drill string. In use, the casing scraper is mechanically driven through the well casing on the drill string, causing the scraper blades or bristles to scrape the inner surface of the well casing.

20 It is known to improve the cleaning action of casing scrapers by circulating

cleaning fluid down the drill string to the casing scraper. The cleaning fluid may exit the drill string at a point below the casing scraper to flow back around the exterior of the cleaning scraper, carrying with it debris and residues scraped from the wall of the well casing as it does so. Alternatively, the cleaning fluid may be directed under pressure through radially extending nozzles in the wall of the casing scraper to scour the wall of the well casing. Fluid circulation around the casing scraper causes debris and residues scraped from the casing walls to be carried to the surface of the well bore for removal.

Whilst the effectiveness of conventional casing scrapers varies from one design to another they all have in common that it is not possible to determine whether debris and residues arriving at the surface of the well bore in the cleaning fluid has been scoured from the particular region of the well casing which is actually subject to cleaning action. In this regard, it will be understood that the cleaning fluid circulating back to the surface of the well bore may pick up material which has been dislodged from the walls of the well casing above the casing scraper itself, as well as below it. This is unsatisfactory in that the well operator has no way of knowing whether the cleaning device is operating in an effective manner.

It is an object of the present invention to provide a casing scraper for cleaning the interior wall of a well casing which allows debris scoured from the wall of a well casing in the immediate vicinity thereof to be collected at will for subsequent inspection at the surface of the well bore.

According to a first aspect of the present invention there is provided a casing

scraper connectable to a drill string for cleaning the interior wall of a well casing, comprising a generally cylindrical body adapted for connection to the work string, a plurality of scraping elements disposed around the outer surface of the cylindrical body for contacting the interior wall of the well casing, an annular bore extending through the cylindrical body, the upper most end of which is adapted for connection to a source of cleaning fluid, and a pipe extending below the lowermost end of the cylindrical body and connected to the lowermost end of the throughbore therein, which pipe has openings in it through which cleaning fluid may be circulated into the well casing, wherein the casing scraper further comprises a filter located between the openings in the pipe and the uppermost end of the cylindrical body for collecting debris and residue in the cleaning fluid, and remotely operable means for selectively directing the flow of cleaning fluid from around the filtration means to through the filtration means.

In a preferred embodiment of the present invention the filtration means is housed within the cylindrical body. However, it may be housed separately from the cylindrical body.

Conveniently, the means for selectively directing cleaning fluid through the filtration means comprises a radially expandable element, such as a rubber, which is engageable with the casing wall to prevent fluid flow around the outer periphery thereof, which rubber has flow apertures therein which open into the filtration means. In normal use fluid takes the path of least resistance around the periphery of the rubber and little or no fluid passes through the filtration means. However, when the rubber is operated to block the fluid flow path around its periphery the fluid is forced to pass

through the flow apertures and into the filtration means.

Conveniently, the rubber is compressed between two plates which are operatively moveable relative to one another to reduce the distance there between. The relative movement may be achieved in a variety of ways.

5           Embodiments of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 shows a vertical section in schematic form of an oil well casing with a casing scraper in accordance with the present invention positioned therein and carrying out a cleaning operation thereon;

10           Figure 2 shows the casing scraper of Figure 1 after it has been switched to re-direct cleaning fluid returning to the surface from passing between the exterior of the cylindrical body and the interior wall of the well casing to passing through the filter located within the cylindrical body; and

15           Figure 3 shows details of a casing scraper according to the present invention comprising a pressure operated valve arrangement for isolating the filtration means and preventing debris collected thereon from washing back out.

20           Referring to Figure 1 of the drawings there is shown a casing scraper comprising a cylindrical body 1 having a plurality of groups 2 of wire bristles disposed in the outer surface thereof. The outer diameter of the casing scraper is defined by the wire bristles and is such that the ends of the wire bristles scrape the interior surface of a well casing 3. Although not shown in the drawing the cylindrical body 1 is adapted for connection to the end of a drill string. To this end the upper end of the cylindrical body may be

provided with a threaded mandrel. The interior of the cylindrical body 1 defines a cavity within which is located a filter medium 4. The filter medium 4 may be loose or may be in the form of a removable cartridge. Access to the filter medium for the purposes of removal and inspection is through a removable plate 5 defining the transverse lower end face of the cylindrical body 1.

A pipe 6 extends through the transverse upper end face of the cylindrical body 1 and into the filter medium 4. The upper end of the pipe 6 which lies outside the cylindrical body 1 is adapted to be connected to a source of cleaning fluid at the surface of the well bore. The lower end of the pipe 6, which terminates within the cylindrical body 1, is connected by a sliding fit to a tail pipe 7. The tail pipe 7 extends through the removable plate 5 defining the transverse lower end face of the cylindrical body. Apertures 8 are provided in the lower end of the tail pipe 7 and it will be understood that cleaning fluid pumped from the well surface down the drill string will pass through the pipe 6, the tail pipe 7 and into the interior of the well casing below the cylindrical body 1 through the apertures 8.

Mounted on the tail pipe 7 immediately below the lowermost end of the cylindrical body 1 is a pack off rubber 9 and a pack off disc 10. The pack off rubber 9 forms a sliding fit on the tail pipe 7, but the pack off disc 10 is rigidly connected thereto. Apertures are provided in the disc 10, the rubber 9 and in the removable plate 5 which, under operating conditions to be described in greater detail hereinbelow, are aligned to define flow paths for the cleaning fluid pumped through the tail pipe 7 into the interior of the well casing back into the cavity defined by the cylindrical body 1 and

through the filter medium 4. The cleaning fluid is then able to pass from the cavity in the cylindrical body through apertures 11 in the sidewalls of the cylindrical body 1.

In normal use the casing scraper is forced through a well casing on the drill string until the region of the well casing to be cleaned is reached. At this point cleaning fluid is pumped through the drill string and out into the interior of the well casing below the casing scraper itself. The cleaning fluid flows around the disc 10 and the rubber 9 and passes between the exterior of the cylindrical member 1 and the wall of the well casing towards the surface, removing with it debris and residues scraped from the wall of the well casing by the wire bristles 2. The casing scraper may also be rotated during the cleaning process by the drill string to facilitate a more thorough scouring of the casing wall. In this regard, operation of the casing scraper according to the present invention is essentially conventional.

Referring now to Figure 2 operation of the casing scraper according to the present invention to collect in the filter medium 4 residues and debris dislodged from the casing wall will be described. At any stage during the cleaning operation it may be required to collect residues and debris for subsequent inspection at the surface of the well bore. To achieve this the cylindrical member 1 is driven downwards on the drill string to cause relative longitudinal displacement of the tail pipe 7 relative to the pipe 5. As shown in Figure 2, this is achieved by resting the lowermost end of the tail pipe 7 on the bottom of the well bore to brace it against the downward movement of the pipe 5. However, as an alternative to this the end of the tail pipe 7 may be engaged with the casing wall.

The relative displacement of the tail pipe 7 towards the cylindrical body 1 causes the rubber 9 to be compressed between the removable plate 5 and the fixed plate 10. This compression results in the rubber 9 expanding radially into tight engagement with the casing wall, thus isolating the region of the well casing below the casing scraper from the region above it. Now as cleaning fluid is pumped down the drill string and into the well casing through the apertures 8 in the tail pipe 7 the return flow has to pass through the flow paths 15 defined by the aligned apertures in the fixed plate 10, the rubber 9 and the removable plate 5, through the filter medium 4 within the cylindrical body 1 and out through the apertures 11 in the side walls of the cylindrical body 1. Any debris and residues contained within the cleaning fluid become trapped in the filter medium which can be inspected when the casing scraper is subsequently removed from the well casing.

A further advantage of the present invention is that as the filter medium becomes increasingly clogged with debris and residues the pressure required to pump cleaning fluid through it will increase. When the pressure reaches a predetermined level this may be interpreted by operatives on the surface as a signal that the cleaning operation is completed. As a precaution against the pressure in the drill string rising to an unacceptable level due, in particular, to the filtration means 4 becoming blocked up, pressure relief devices may be provided in the path of the cleaning fluid.

In the embodiment of the present invention described hereinbefore the rubber 9 is shown as being compressed between the removable plate 5 and the fixed plate 10 as a result of the tail pipe being braced against the bottom of the well casing or against

the side thereof. It will be appreciated that alternative methods and techniques may be employed for switching the fluid flow path from around the exterior of the casing scraper to through the filter medium contained therein. For example, the tail pipe and the pipe may be joined by screw threaded sections, such that rotation of the drill string causes one to be screwed onto the other thereby reducing the distance between the plates and causing compression of the rubber. Alternatively, a flexible cup may be provided to the rear of the fixed plate which cup is caused to expand radially outwards into engagement with the casing wall under the effect of hydraulic pressure. This then provides a brace for the relative longitudinal movement of the pipe to the tail pipe and compression of the rubber.

Referring now to Figure 3 there is shown a detail of the interior of a casing scraper according to the present invention and more specifically of a valve arrangement for isolating the filtration medium 4 contained within the cavity of the cylindrical body 1 when cleaning fluid is not being pumped therethrough. The valve arrangement serves to prevent debris and residue collected in the filtration means from being washed back out. The valve arrangement comprises a disc 20 which is mounted on the tail pipe 7 to cover the holes 21 in the removable plate 5 which form the flow paths into the filtration means 4. The disc 20 is slidable up and down on the tail pipe 7 between the removable plate 5 and a retaining lip 22 on the tail pipe. During pumping with the pack off rubber in place to direct fluid through the filtration means 4 the disc 20 rises to allow fluid to enter. As soon as pumping ceases the disc drops pack down to cover the holes 21.

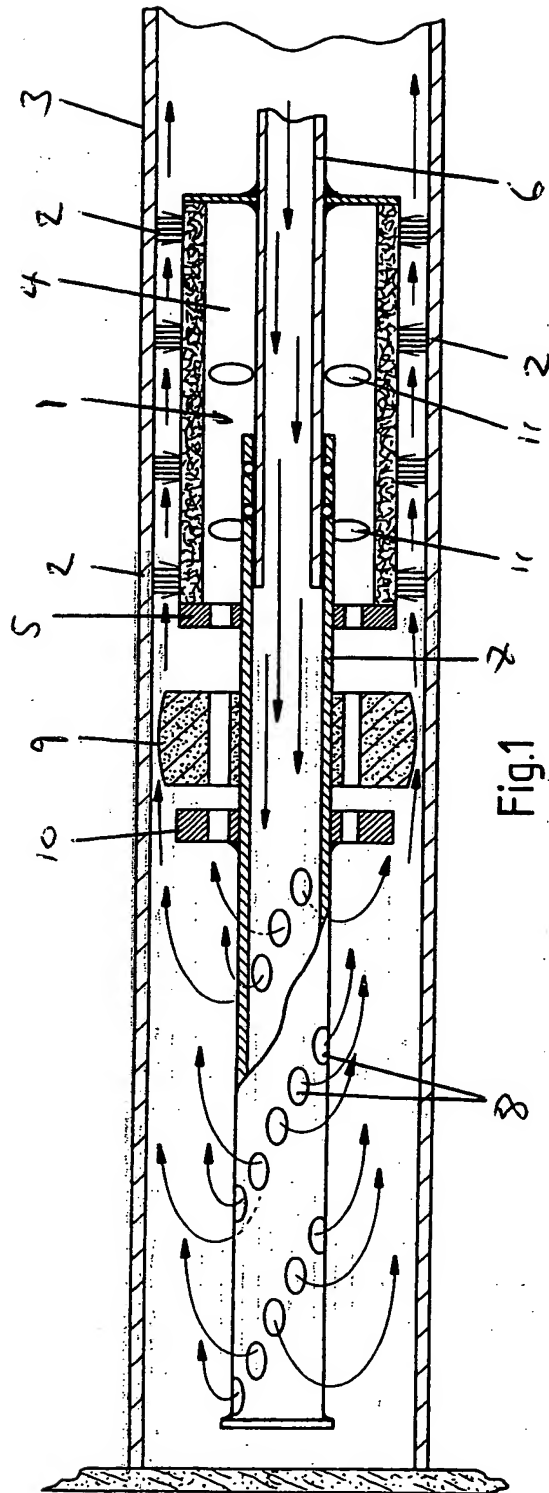
It will further be understood that the filter medium may be housed separately



from the cylindrical body which carries the scraper elements.

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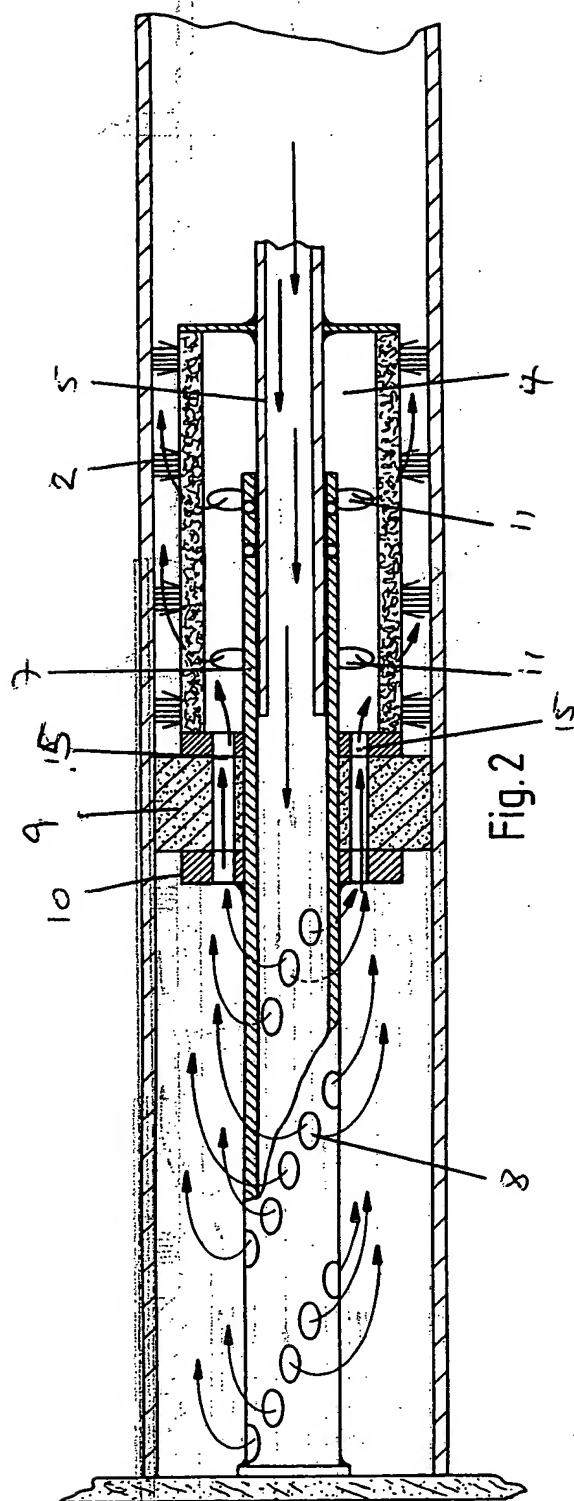
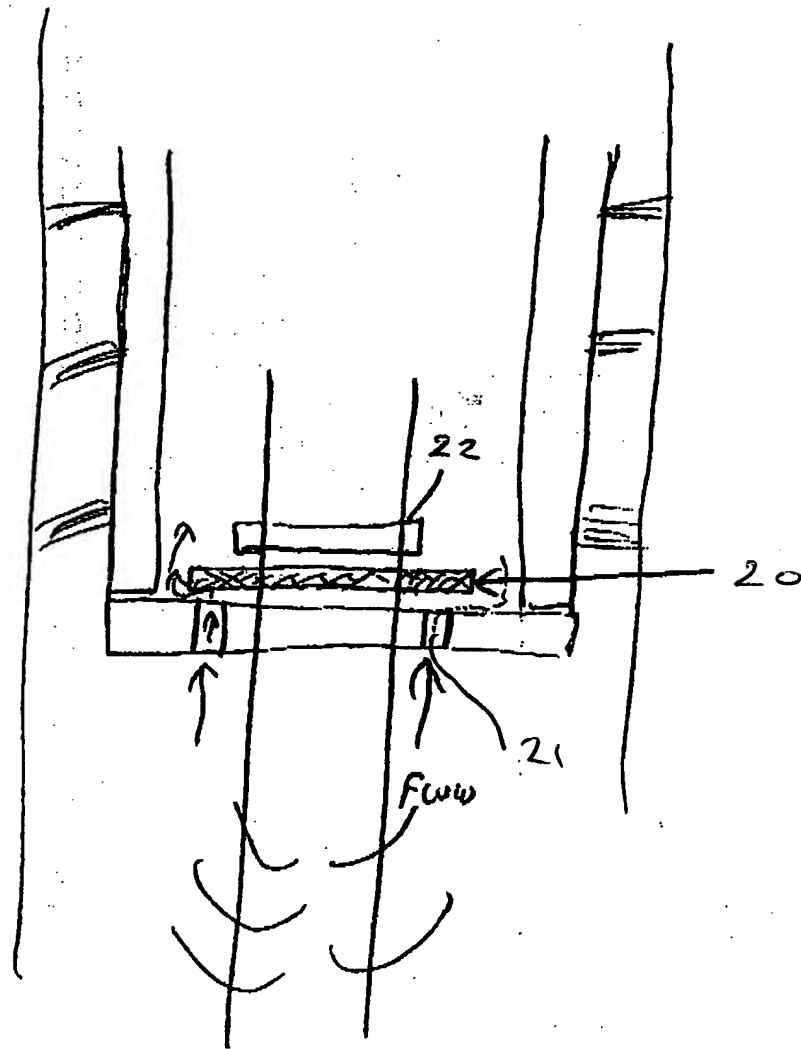


Fig. 2



FIG 3

